IS 10438 (1983): Potassium Sulphite, 650 g/1 Aqueous Solution for Photographic Industry [CHD 5: Electroplating Chemicals and Photographic Materials]

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IS : 10438 - 1983

Indian Standard

SPECIFICATION FOR POTASSIUM SULPHITE, 650 g/l AQUEOUS SOLUTION FOR PHOTOGRAPHIC INDUSTRY

UDC 661·832·52 : 771·7

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3 *April* 1983

AMENDMENT NO. 1 JANUARY 1988

TO

IS:10438-1983 SPECIFICATION FOR POTASSIUM SULPHITE, 650 g/l AQUEOUS SOLUTION FOR PHOTOGRAPHIC INDUSTRY

(First cover page, pages 1 and 3, title) - Substitute the following for the existing title:

'Indian Standard

SPECIFICATION FOR POTASSIUM SULPHITE SOLUTION, PHOTOGRAPHIC GRADE'

(Page 4, clause 1.1, line 2) - Substitute 'potassium sulphite solution, photographic grade' for 'potassium sulphite, 650 g/l aqueous solution for photographic industry'.

(Page 4, Table 1, caption) - Substitute the following for the existing caption:

'TABLE 1 REQUIREMENTS FOR POTASSIUM SULPHITE SOLUTION, PHOTOGRAPHIC GRADE'

(Page 5, Appendix A, caption) - Substitute the following for the existing caption:

'METHODS OF TEST FOR POTASSIUM SULPHITE SOLUTION, PHOTOGRAPHIC GRADE'

(Page 9, Appendix B, caption) - Substitute the following for the existing caption:

'SAMPLING OF POTASSIUM SULPHITE SOLUTION, PHOTOGRAPHIC GRADE'

(CDC 44)

Reprography Unit, BIS, New Delhi, India

Indian Standard

SPECIFICATION FOR POTASSIUM SULPHITE, 650 g/l AQUEOUS SOLUTION FOR PHOTOGRAPHIC INDUSTRY

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Indian Standard

SPECIFICATION FOR POTASSIUM SULPHITE, 650 g/l AQUEOUS SOLUTION FOR PHOTOGRAPHIC INDUSTRY

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 31 January 1983, after the draft finalized by the Photographic Materials Sectional Committee had been approved by the Chemical Division Council.

0.2 This standard is one of a series of Indian Standards for photographic grade chemicals which are commonly used in the processing of sensitized photographic materials. The specification lays down chemical and physical requirements. While it is recognized that the ultimate criterion of the quality of a photographic chemical is its successful performance in a photographic test, present knowledge indicates that, from a practical standpoint, chemical and physical methods of testing are generally adequate. The photographic industry has accumulated a comprehensive collection of such chemical tests for impurities. These tests which correlate with objectionable photographic effect have been drawn up in the formulation of these specifications. Chemical tests are generally more sensitive, less variable and less costly than photographic tests.

0.3 This standard is based on ISO/DIS 5990-1978 Photographic grade potassium sulphite, 650 g/l aqueous solution — specification, prepared by International Organization for Standardization (ISO).

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for potassium sulphite, 650 g/l aqueous solution for photographic industry.

2. REQUIREMENTS

2.1 Description — The material shall be in the form of a clear, colourless or almost colourless liquid of chemical formula $K_2S_2O_3$.

2.2 Appearance — When examined visually, 100 ml of the material diluted with 400 ml of water shall be clear and free from sediment other than a slight flocculence.

2.3 The material shall also conform to the requirements prescribed in Table 1 when tested according to the methods prescribed in Appendix A. Reference to the relevant clauses of Appendix A is given in col 4 of the table.

TABLE 1 REQUIREMENTS FOR POTASSIUM SULPHITE, 650 g/l AQUEOUS SOLUTION FOR PHOTOGRAPHIC INDUSTRY

(*Clauses* 2.3, A-5.3.1, A-6.3.2, A-7.3.1, B-3.1 *and* B-4.3)

Sl No.	Characteristic	Requirement	Method of Test (Ref to Cl No. in Appendix A)
(1)	(2)	(3)	(4)
i)	Potassium sulphite content (K_2SO_3), percent by mass	44·5 to 46·0	A-2
ii)	Density, g/ml at 20°C	1·445 to 1·460	A-3
iii)	*p*H at 20°C	8·0 to 10·0	A-4
iv)	Thiosulphate content (as $K_2S_2O_3$), percent by mass, *Max*	0·01	A-5
v)	Heavy metals (as Pb), percent by mass, *Max*	0·002	A-6
vi)	Iron (as Fe), percent by mass, *Max*	0·002	A-7
vii)	Reaction to ammoniacal silver nitrate	To pass the test	A-8

3. PACKING AND MARKING

3.1 Packing — The material shall be packed in glass bottles or in such other containers as agreed to between the purchaser and the supplier.

3.2 Marking — The containers shall be securely closed and marked legibly and indelibly with the following information:

a) Name of the material,

b) Net content,

c) Date of manufacture,

d) Manufacturer's name and/or his recognized trade-mark, if any, and

e) Batch number to enable the lot of manufacture to be traced from records

3.2.1 The containers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution

4. SAMPLING

4.1 The method of drawing representative sample of the material from the lot, the number of tests to be performed and the method of finding out the criteria of conformity of the material to the requirements of this specification shall be as prescribed in Appendix B.

APPENDIX A

(*Clause* 2.3)

METHODS OF TEST FOR POTASSIUM SULPHITE, 650 g/l AQUEOUS SOLUTION FOR PHOTOGRAPHIC INDUSTRY

A-1. QUALITY OF REAGENTS

A-1.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070-1977*) shall be used in tests

NOTE — ' Pure chemicals ' shall mean chemicals that do not contain impurities which affect the results of analysis

*Specification for water for general laboratory use (*second revision*)

A-2. DETERMINATION OF POTASSIUM SULPHITE CONTENT

A-2.1 Reagents

A-2.1.1 *Iodine Solution* — 0·05 N.

A-2.1.2 *Glacial Acetic Acid*

A-2.1.3 *Standard Sodium Thiosulphate Solution* — 0·1 N.

A-2.1.4 *Starch Indicator Solution* — 5 g/l. Stir 5 g of soluble starch with 100 ml of a 10 g/l salicylic acid solution. Then add 300 to 400 ml of boiling water, boil until the starch dissolves, then finally dilute to 1 000 ml with water.

A-2.2 Procedure — Weigh, accurately about 7 g of the sample, transfer to the 250 ml volumetric flask and make up to the mark with water, mixing well. Using a pipette deliver 25 ml of the iodine solution into a flask, 5 ml of glacial acetic acid and then add 10 ml of the diluted sample. Titrate the excess iodine with the standard sodium thiosulphate solution. Add a few drops of the starch indicator just before the end point.

A-2.3 Calculation

$$\text{Potassium sulphite } (K_2SO_3),\ \text{percent by mass} = \frac{197{\cdot}8\,(25\,N_1 - VN_2)}{M}$$

where

N_1 = normality of iodine solution,

N_2 = normality of sodium thiosulphate solution,

V = volume in ml of sodium thiosulphate solution used for the titration, and

M = mass in g of the material present in aliquot.

A-3. DETERMINATION OF DENSITY

A-3.1 Procedure — Determine the density of the sample by means of a hydrometer at 20°C.

A-4. DETERMINATION OF *p*H

A-4.1 Procedure — Take 10 ml of the sample, add 90 ml of water and mix well. Measure the *p*H of the solution using a suitable *p*H meter, at 20°C.

A-5. TEST FOR THIOSULPHATE

A-5.1 Reagents

A-5.1.1 *Dilute Standard Sodium Thiosulphate Solution* — Dilute 5 ml of the standard sodium thiosulphate solution (**A-2.1.2**) to 1 000 ml.

A-5.1.2 *Mercury (II) Chloride Reagent* — Dissolve 25 g of potassium bromide and 25 g of mercury (II) chloride in 900 ml of water at 50°C. Cool, dilute to 1 000 ml and allow to stand overnight. Filter if not perfectly clear.

A-5.2 Apparatus

A-5.2.1 *Nessler Cylinders* — 50-ml capacity.

A-5.3 Procedure — Dilute 10 ml of the sample with 90 ml of water. Slowly pipette 1·8 ml of this solution into 10 ml of the mercury (II) chloride reagent solution in one of the Nessler cylinders. To 10 ml of the mercury (II) chloride reagent solution contained in the second Nessler cylinder, slowly, add 0·25 ml of the dilute standard thiosulphate solution (**A-5.1.1**). Allow both to stand for 10 min without agitation, then carefully agitate to distribute the opalescence. Immediately examine the opalescence produced in the test and control solutions.

NOTE — If the solutions are allowed to stand for more than 15 min, secondary reactions occur which will affect the result.

A-5.3.1 The material shall be considered to have conformed to the limit prescribed in Table 1 if the opalescence produced with the sample is not more than that in the control test.

A-6. TEST FOR HEAVY METALS

A-6.1 Reagents

A-6.1.1 *Concentrated Hydrochloric Acid* — *See* IS : 265-1976*.

A-6.1.2 *Dilute Hydrochloric Acid* — 1 : 99 (*v/v*).

A-6.1.3 *Dilute Ammonium Hydroxide* — 1 : 9 (*m/m*).

A-6.1.4 *Standard Heavy Metal Solution* — Dissolve a soluble lead salt in water to give a solution containing 10 mg of lead per 1 000 ml.

A-6.1.5 *Hydrogen Sulphide* — Saturated solution at room temperature.

A-6.1.6 *p-Nitrophenol Indicator Solution* — 2·5 g/l.

*Specification for hydrochloric acid (*second revision*).

A-6.2 Apparatus

A-6.2.1 *Nessler Cylinders* — 50-ml capacity.

A-6.3 Procedure — Weigh accurately 5 g of the sample and dilute to 15 ml with water. Also take 10 ml of the standard heavy metal solution and treat this and the test solution in the following manner. Add 15 ml of concentrated hydrochloric acid and evaporate to dryness on a steam bath. Take up the residues with 25 ml of water. To each, add 2 drops of *p*-nitrophenol indicator solution followed by the ammonia solution, drop by drop, until the solutions turn yellow. Add dilute hydrochloric acid drop by drop, until the solutions become colourless and add 2·5 ml in excess. Dilute each to 100 ml with water.

A-6.3.1 Treat 30-ml aliquots of each solution separately in the Nessler cylinders retaining the balance of the test solution for the iron test. Add 5 ml of hydrogen sulphide water, dilute to 50 ml and mix well. Compare the colours produced in the test and control solutions.

A-6.3.2 The material shall be considered to have conformed to the limit prescribed in Table 1 if the colour produced with the sample is not deeper than in the control test.

A-7. TEST FOR IRON

A-7.1 Reagents

A-7.1.1 *Concentrated Hydrochloric Acid* — *See* IS : 265-1976*.

A-7.1.2 *Acetate Buffer Solution* — *p*H 5·0. Dissolve 23 g of anhydrous sodium acetate in 58 ml of 2 M acetic acid and dilute to 1 000 ml. Adjust the final *p*H to 5·0 ± 0·1 with glacial acetic acid or 100 g/l sodium hydroxide solution.

A-7.1.3 *Standard Iron Solution* — Dissolve a soluble iron (III) salt in water to give a solution containing 10 mg of iron (III) per 1 000 ml.

A-7.1.4 *1:10-Phenanthroline Reagent Solution* — Thoroughly mix equal volumes of a 1 g/l aqueous solution of 1 : 10 phenanthroline, a 100 g/l aqueous solution of hydroxylammonium chloride and the acetate buffer solution.

A-7.2 Apparatus

A-7.2.1 *Nessler Cylinders* — 50 ml capacity.

A-7.3 Procedure — Take 10 ml of the standard iron solution and treat in the same manner as the 10 ml of the standard heavy metals solution under **A-6.3**, as far as the dilution to 100 ml. Transfer a 10 ml aliquot of this treated standard iron solution to a Nessler cylinder and 10 ml of the

*Specification for hydrochloric acid (*second revision*).

balance of the treated test solution from **A-6.3.1** to the other Nessler cylinder. Add 5 ml of the 1 : 10-phenanthroline reagent solution to each, mix and allow to stand for 10 min. Dilute each to 50 ml and mix well. Compare the colours produced in the test and control solutions.

A-7.3.1 The limit prescribed in Table 1 shall be considered to have not exceeded if the colour produced with the sample is not deeper than in the control test.

A-8. TEST FOR REACTION TO AMMONIACAL SILVER NITRATE

A-8.1 Reagents

A-8.1.1 *Ammoniacal Silver Nitrate Solution* — Immediately before use, mix equal volumes of ammonium hydroxide (density approximately 0·91 g/ml) and 100 g/l aqueous silver nitrate solution.

A-8.2 Apparatus

A-8.2.1 *Nessler Cylinder* — 50 ml capacity.

A-8.3 Procedure — Measure, to a nearest 0·1 ml, 10 ml of the sample and dilute to 200 ml with water. Take 20 ml of this solution in a Nessler cylinder, add 10 ml of the freshly prepared ammoniacal silver nitrate solution and mix well. To a further 20 ml of the sample in the other Nessler cylinder, add 5 ml of ammonium hydroxide (density approximately 0·91 g/l), add 5 ml of water and mix well. Compare the colours and turbidities of the test and control solutions.

NOTE — Dispose of all test solutions and rinse apparatus used immediately. Explosive compounds may be formed on standing.

A-8.3.1 The material shall be considered to have passed the test if the colour and turbidity produced with the sample is not more than in the control test.

APPENDIX B

(*Clause* 4.1)

SAMPLINC OF POTASSIUM SULPHITE, 650 g/l AQUEOUS SOLUTION FOR PHOTOGRAPHIC INDUSTRY

B-1. SCALE OF SAMPLING

B-1.1 Lot — All the containers in a single consignment of the material drawn from a single batch of packing shall constitute a lot. If the

consignment is found to consist of different batches of packing, the containers belonging to the same batch shall be grouped together and each such group shall constitute a separate lot.

B-1.2 For ascertaining the conformity of the material to the requirements of this specification, samples shall be tested separately for each lot. The number of containers to be selected at random from lots of different sizes shall be in accordance with Table 2.

TABLE 2 NUMBER OF CONTAINERS TO BE CHOSEN

Lot Size	Sample Size
N	n
(1)	(2)
Up to 40	5
41 to 110	7
111 ,, 300	10
301 ,, 800	15
801 and above	20

NOTE — In the case of lots of size less than 5, all the containers of the lot shall be included in the sample.

B-1.2.1 In order to ensure randomness of selection, use of random sampling tables (*see* IS : 4905-1968*) is recommended. If the tables are not available, the following procedure may be used:

Arrange all the containers in the lot in a systematic manner and starting from any one, count them as 1, 2, ... , r where r is the integral part of N/n (N and n being the lot size and sample size, respectively). Every rth container thus counted shall be withdrawn to constitute the sample.

B-2. PREPARATION OF TEST SAMPLES

B-2.1 From each of the containers selected according to **B-1.2.1**, a representative portion of the material sufficient for carrying out the tests specified under **2.3**, shall be drawn separately.

B-2.2 From each of the portions of the material drawn according to **B-2.1**, a small but equal quantity shall be taken and thoroughly mixed to form a composite test sample.

*Methods for random sampling.

B-2.3 The remaining portion of the material drawn from each container shall be transfered to separate bottles and labelled with full identification particulars on the bottles. The material in each individual bottle shall constitute an individual test sample.

B-3. NUMBER OF TESTS

B-3.1 Tests for the determination of potassium sulphite content (*see* Table 1) of the material shall be conducted on each of the individual test samples and the test results shall be recorded separately for different test samples.

B-3.2 Tests for the requirements of all other characteristics given in Table 1 shall be carried out on the composite test sample.

B-4. CRITERIA FOR CONFORMITY

B-4.1 From the test results recorded according to **B-3.1**, the mean ($\bar{x}$) and range (R) of test results for any characteristic shall be computed as follows:

$$\text{Mean } (\bar{x}) = \frac{\text{Sum of test results } 1, 2, \ldots n}{\text{Number of test results, } n}$$

Range (R) = Difference between the maximum and minimum of the test results.

B-4.2 In the case of samples of size 10 or more, every 5 test results shall be grouped together and the range of each group shall be determined. Average range ($\bar{R}$) shall then be computed from the group ranges as given below:

$$\text{Average range } (\bar{R}) = \frac{\text{Sum of group ranges}}{\text{Number of groups}}$$

B-4.3 The lot shall be declared as conforming to the requirements of the specification for different characteristics if the corresponding criteria for conformity given below are complied:

Characteristic	*Criteria for Conformity*
a) Potassium sulphite content	($\bar{x} - 0{\cdot}6\,R^*$) shall be greater than or equal to the relevant limit prescribed in **2.2**.
b) All other characteristics listed in Table 1	Test results on the composite test sample shall meet the corresponding requirements given in Table 1.

*When the sample size is 10 or more, average range ($\bar{R}$) (*see* **B-4.2**) shall be used in place of range (R).

INDIAN STANDARDS

ON

PHOTOGRAPHIC MATERIALS

IS :

246-1972 Sodium thiosulphate, crystalline (*third revision*)

247-1972 Sodium sulphite, anhydrous (*third revision*)

248-1978 Sodium bisulphite (sodium metabisulphite) (*third revision*)

332-1967 Chromium potassium sulphate (chrome alum) (*first revision*)

388-1972 Hydroquinone, photographic grade (*revised*)

500-1980 Potassium metabisulphite, photographic grade (*third revision*)

557-1978 Sodium acetate, technical and photographic (*second revision*)

2211-1972 Anhydrous sodium thiosulphate, photographic grade (*first revision*)

2318-1980 Silver nitrate, photographic grade (*second revision*)

4173-1974 4-Methylaminophenol sulphate (*first revision*)

5379-1969 Ammonium thiosulphate, photographic grade

5380-1976 Sodium bromide, photographic grade (*first revision*)

5381-1969 Quantity packaging of sensitized photographic materials

5431-1979 Flammability requirements for motion picture safety films

6139-1971 Sizes of photographic paper for general use

6212-1971 Method for the determination of residual thiosulphate in processed black and white photographic films and plates

6650-1972 Method for the determination of residual thiosulphate and tetrathionate in processed photographic papers

6678-1972 Ammonium thiosulphate solution, photographic grade

8281-1976 Hydroxylamine sulphate, photographic grade

8984-1978 Dimensions of 127, 120 and 620 for roll films, backing paper and film spools

9343-1979 1-phenyl-3-pyrazolidone, photographic grade

9644-1980 Sizes of film for medical radiography

10438-1983 Potassium sulphite, 650 g/l aqueous solution for photographic industry

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m s^{-2}
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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Printed at Printograph, New Delhi, India